



New Jersey Department of Environmental Protection  
Division of Science and Research  
P.O. 409, Trenton  
Water Monitoring Project  
Water Monitoring Management

James E. Mumman, Administrator

JUNE 1998

SANITARY SURVEY  
SHELLFISH GROWING AREA 46-47  
BRIGANTINE TO SPRAY BEACH  
1992-1997

Water Monitoring Report Prepared by:

William E. Suoninen

Project Manager

Bureau of Marine Water Monitoring

William J. Eisele, Jr., Chief

**STATE OF NEW JERSEY**  
**CHRISTINE TODD WHITMAN**  
**GOVERNOR**

SANITARY SURVEY  
SHELLFISH GROWING AREA 46-47  
BRIGANTINE TO SPRAY BEACH  
1992-1997



New Jersey Department of Environmental Protection  
ROBERT C. SHINN, Jr.  
COMMISSIONER

**This report was funded  
by a State General Appropriation  
and the  
Federal Clean Water Act**

\_\_\_\_\_ Date \_\_\_\_\_  
Written by: William E. Suoninen  
Project Manager

\_\_\_\_\_ Date \_\_\_\_\_  
Edited by: Bonnie J. Zimmer, Ph.D.  
Environmental Scientist

\_\_\_\_\_ Date \_\_\_\_\_  
Reviewed by: William J. Eisele, Jr.  
Bureau Chief

\_\_\_\_\_ Date \_\_\_\_\_  
Approved by: James E. Mumman  
Administrator

## ***TABLE OF CONTENTS***

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>INTRODUCTION</b>	<b>1</b>
<b>DESCRIPTION</b>	<b>4</b>
<b>METHODS</b>	<b>7</b>
<b>BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS</b>	<b>7</b>
<b>MARINE BIOTOXINS</b>	<b>8</b>
<b>SHORELINE SURVEY</b>	<b>8</b>
<b>HYDROGRAPHY AND METEOROLOGY</b>	<b>10</b>
<b>WATER QUALITY STUDIES</b>	<b>11</b>
<b>INTERPRETATION AND DISCUSSION OF DATA</b>	<b>13</b>
<b>CONCLUSIONS</b>	<b>13</b>
<b>RECOMMENDATIONS</b>	<b>13</b>
<b>LITERATURE CITED</b>	<b>14</b>
<b>ACKNOWLEDGMENTS</b>	<b>14</b>
<b>ATTACHMENT: BACTERIOLOGICAL DATA LISTING</b>	<b>15</b>

***TABLE OF FIGURES***

Figure 1: State of New Jersey Shellfish Agencies ..... 3

Figure 2: Location Map ..... 5

Figure 3: Current Classifications ..... 6

Figure 4: Stormwater Discharges ..... 9

Figure 5: Land Use Map ..... 10

Figure 6: Chart Of Sampling Stations..... 12

***TABLE***

**Table 1: Climatological Data..... 11**

## ***EXECUTIVE SUMMARY***

These ocean shellfish growing waters do not contain any point sources of contamination. The area is not detectably affected by the non-point sources associated with rainfall runoff or the Edwin B. Forsythe National Wildlife Refuge's bird population.

These factors in combination with acceptable water quality support the *Approved* shellfish growing water classification currently in effect and qualifies this section of coastline to be designated a Remote area. A Remote area by National Shellfish Sanitation Program definition allows for a water sampling frequency reduction without any public health consequences. This frees valuable sampling resources to be concentrated in areas containing pollution sources.

## ***INTRODUCTION***

This report is part of a series of studies having a dual purpose. The first and primary purpose is to comply with the guidelines of the National Shellfish Sanitation Program (NSSP) that are established by the Interstate Shellfish Sanitation Conference (ISSC). The second purpose is to input the State Water Quality Inventory Report, which is prepared pursuant to Section 305(b) of the Federal Clean Water Act (P.L. 95-217).

The information contained in the growing area reports is also used for the New Jersey State Water Quality Inventory Report (305b) which provides an assessment to Congress every two years of current water quality conditions in the State's major rivers, lakes, estuaries, and ocean waters. The reports provide valuable information for the 305(b) report, which describes the waters that are attaining state designated water uses and national clean water goals; the pollution problems identified in surface waters; and the actual or potential sources of pollution. Similarly, the reports utilize relevant information contained in the 305(b) report, since the latter assessments are based on instream monitoring data (temperature, oxygen, pH, total and fecal coliform bacteria, nutrients, solids, ammonia and metals), land-use profiles, drainage basin characteristics and other pollution source information.

From the perspective of the Shellfish Classification Program, the reciprocal use of water quality information from reports represent two sides of the same coin: the growing area report focuses on the estuary itself, while the 305(b) report describes the watershed that drains to that estuary.

The Department participates in a cooperative initiative (NEPPS program) with the USEPA which emphasizes ongoing evaluation of issues associated with environmental regulation, including assessing impacts on water bodies and measuring improvements in various indicators of environmental health. The shellfish growing area reports are intended to provide a brief assessment of the growing area, with particular emphasis on those factors that affect the quantity and quality of the shellfish resource. As the Department implements a comprehensive watershed management program in conjunction with the NEPPS initiative, the shellfish growing area reports provide valuable information

on the overall quality of the saline waters in the most downstream sections of each major watershed. In addition, the reports assess the quality of the biological resource and provide a reliable indicator of potential areas of concern and/or areas where additional information is needed to accurately assess watershed dynamics.

As a brief history, the NSSP developed from public health principles and program controls formulated at the original conference on shellfish sanitation called by the Surgeon General of the United States Public Health Service in 1925. This conference was called after oysters were implicated in causing over 1,500 cases of typhoid fever and 150 deaths in 1924. The tripartite cooperative program (federal, state and shellfish industry) has updated the program procedures and guidelines through workshops held periodically until 1977. Because of concern by many states that the NSSP guidelines were not being enforced uniformly, a delegation of state shellfish officials from 22 states met in 1982 in Annapolis, Maryland, and formed the ISSC. The first annual meeting was held in 1983 and continues to meet annually at various locations throughout the United States.

Parts I and II of the NSSP Manual set forth the principles and requirements for the sanitary control of shellfish produced and shipped in interstate commerce in the United States. They provide basis used by the Federal Food and Drug Administration (FDA) in evaluating state shellfish sanitation programs. There are five major points on which the state is evaluated by the FDA include:

1. The classification of all actual and potential shellfish growing areas as to their suitability for shellfish harvesting.
2. The control of the harvesting of shellfish from areas which are classified as *Restricted*, *Prohibited* or otherwise closed.
3. The regulation and supervision of shellfish resource recovery programs.
4. The ability to restrict the harvest of shellfish from areas in a public health emergency, and
5. Prevent the sale, shipment or possession of shellfish which cannot be identified as being produced in accordance with the NSSP and have the ability to condemn, seize or embargo such shellfish.

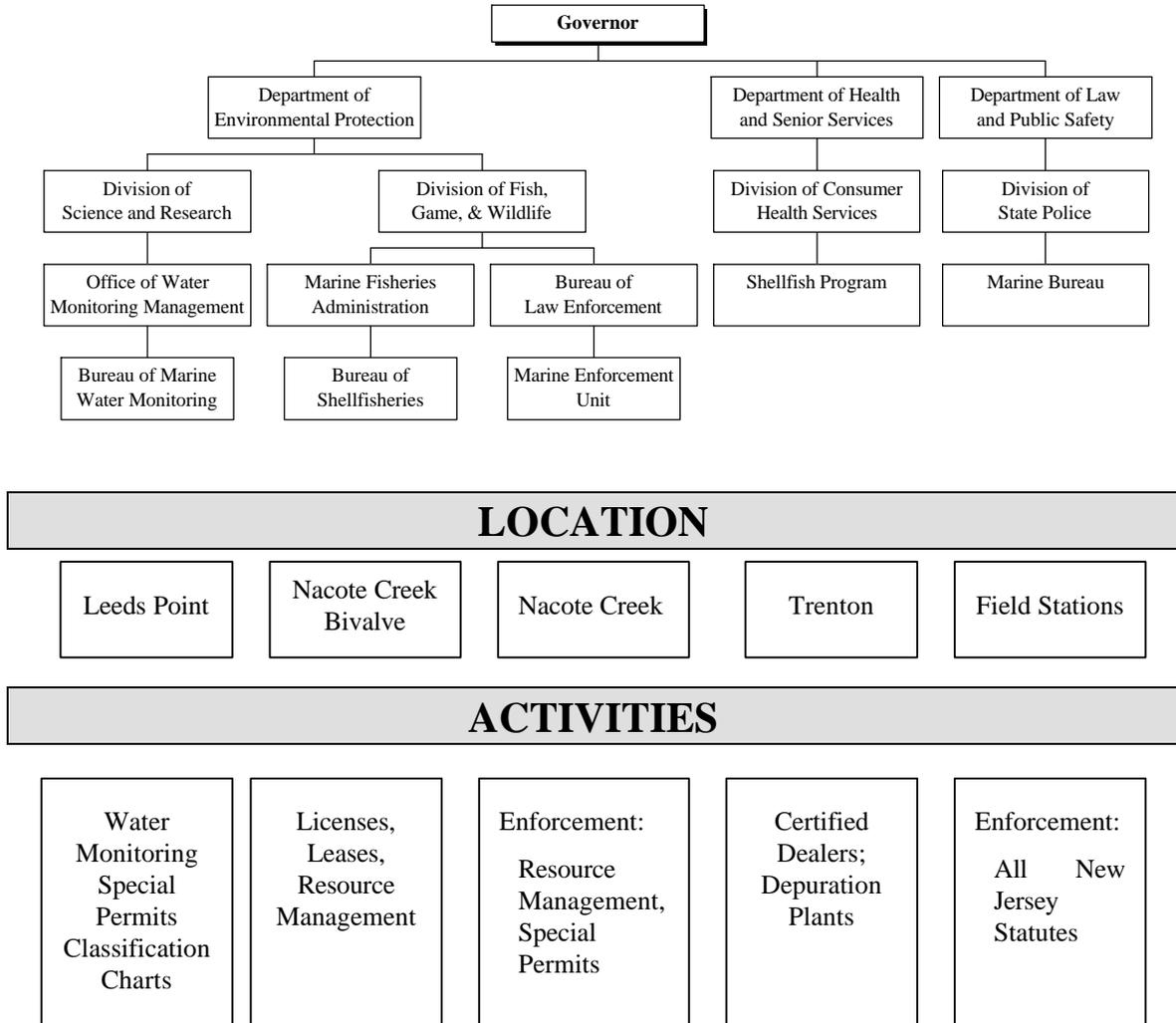
The authority to carry out these functions is divided between the Department of Environmental Protection (DEP), the Department of Health and Senior Services, and the Department of Law and Public Safety. The Bureau of Marine Water Monitoring (BMWM) under the authority of N.J.S.A. 58:24 classifies the shellfish growing waters and administers the special resource recovery programs. Regulations delineating the growing areas are promulgated at N.J.A.C. 7:12 and are revised annually. Special Permit rules are also found at N.J.A.C. 7:12 and are revised as necessary.

The Bureau of Shellfisheries in the Division of Fish, Game and Wildlife issues harvesting licenses and leases for shellfish grounds under the Authority of N.J.S.A. 50:2 and N.J.A.C. 7:25. This bureau in conjunction with the BMWM administers the Hard Clam Relay Program.

The Bureau of Law Enforcement in the DEP (Division of Fish, Game, and Wildlife) and the Division of State Police in the Department of Law and Public Safety enforce the provisions of the statutes and rules mentioned above.

The Department of Health is responsible for the certification of wholesale shellfish establishments and in conjunction with the BMWWM, administers the depuration program.

**Figure 1: State of New Jersey Shellfish Agencies**



Emphasis is placed on the sanitary control of shellfish because of the direct relationship between pollution of shellfish growing areas and the transmission of diseases to humans. Shellfish borne infectious diseases are generally transmitted via a fecal-oral route. The

pathway is complex and quite circuitous. The cycle usually begins with fecal contamination of the shellfish growing waters. Sources of such contamination are many and varied. Contamination reaches the waterways via runoff and direct discharges.

Clams, oysters and mussels pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish also concentrate microorganisms, which may include pathogenic microbes, and toxic heavy metals/chemicals. It is imperative that a system is in place to reduce the human health risk of consuming shellfish from areas of contamination.

Accurate classifications of shellfish growing areas are completed through a comprehensive sanitary survey. The principal components of the sanitary survey report include:

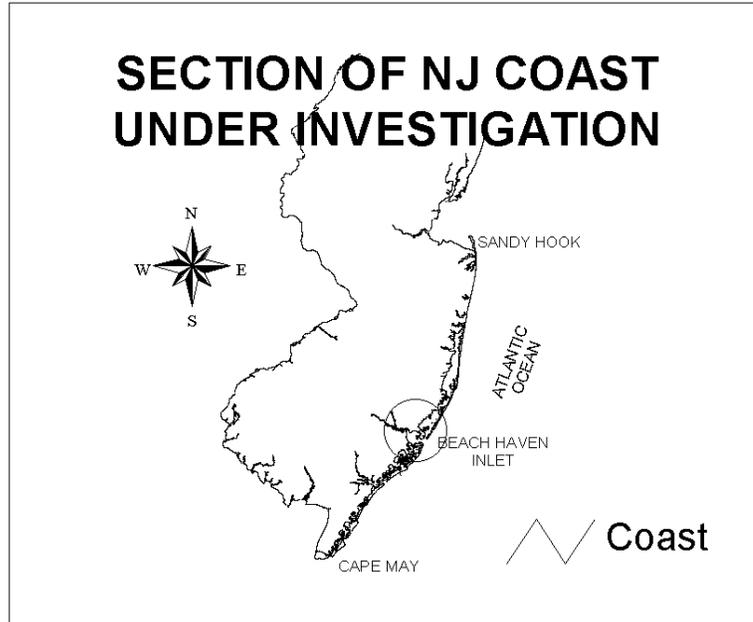
1. An evaluation of all actual and potential sources of pollution,
2. An evaluation of the hydrography of the area and
3. An assessment of water quality. Complete intensive sanitary surveys are conducted every 12 years with interim narrative evaluations completed on a three year basis. If major changes to the shoreline or bacterial quality occur, then the intensive report is initiated prior to its 12 year schedule.

The following narrative constitutes this bureau's assessment of the above mentioned components and determines the current classification of the shellfish growing waters.

### ***DESCRIPTION***

The ocean shellfish growing waters covered by this Sanitary Survey includes approximately 15 miles of coastline from Brigantine on the south to Spray Beach on the north, and offshore to the State's three mile jurisdictional limit. (Please be advised that "miles" in this report are in the nautical measure, whereby, one nautical mile equates to 6,076 feet). This area is also displayed on Charts 6 and 7 of the current Shellfish Growing Water Classification Charts.

**Figure 2: LOCATION MAP**



The last Sanitary Survey for Area 46-47 covered the time frame 1984 through 1986 and found the following:

1. All of the waters contained within this area continued to meet the National Shellfish Sanitation Program's (NSSP) bacteriological criteria for *Approved* shellfish growing waters.
2. Nonpoint pollution sources associated with rainfall runoff and the Edwin B. Forsythe National Wildlife Refuge's large avian population were not significant water quality problems for this ocean area.
3. With a historical record of what could be subjectively termed "*excellent water quality*" and an absence of any major pollution source in the region, it was recommended that the future water sampling frequency be reduced to the minimum of five sample sets per year. This would divert scarce sampling resources to other shellfish growing areas containing significant pollution sources such as waste water treatment plant outfalls. This recommendation was implemented.

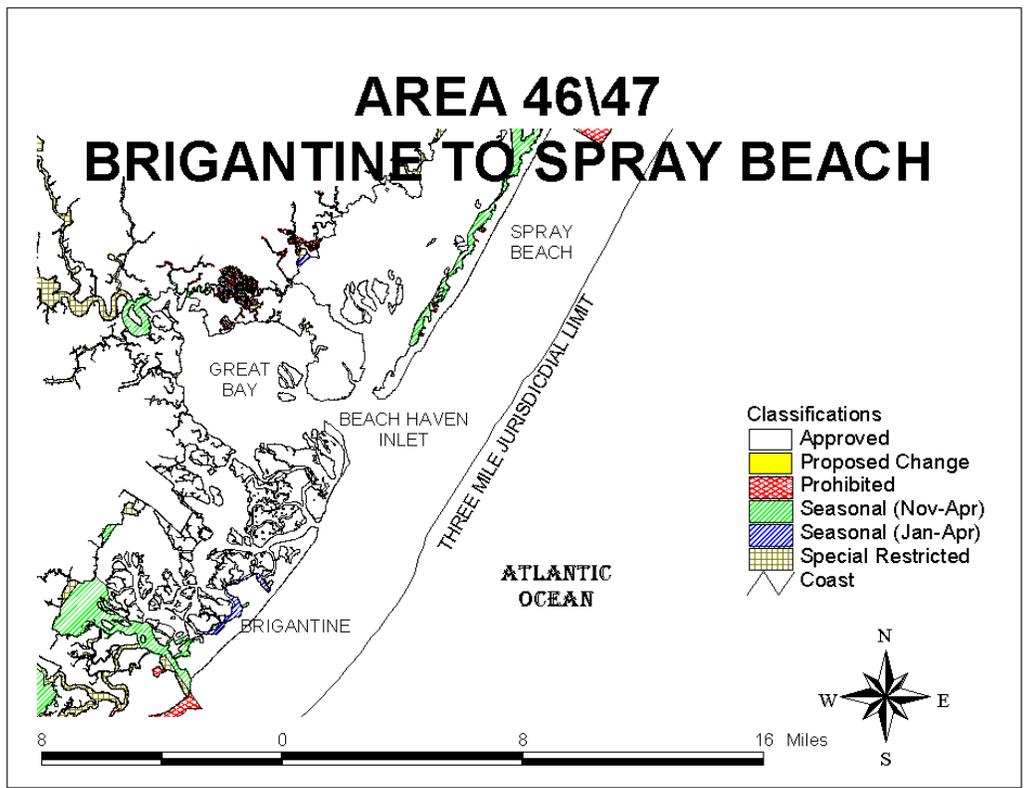
A subsequent Reevaluation covering the time period 1988 to 1990 found the Sanitary Survey to be still representative of the area's conditions and recommended that the current *Approved* classification remain in effect.

The most recent Reevaluation covering the time frame 1991 to 1993 not only confirmed the above studies but recommended the growing area be designated a Remote area. A Remote area is an area defined by the NSSP's Manual of Operations that has no human population, is not impacted by any actual or potential pollution sources and meets the *Approved* classification criteria. In return, this will further reduce the minimum sampling frequency from five times per year to two times per year. This recommendation was also implemented.

Since all the waters under investigation are classified as *Approved*, they are available for harvesting surf clams (*Spisula solidissima*) and blue mussels (*Mytilus edulis*) by dredge boats licensed by the Department's Division of Fish, Game and Wildlife.

For 1995, surf clams yielded 46.3 million pounds of meats in New Jersey for an exvessel value of \$27.4 million. In addition to being the State's largest molluscan fishery, New Jersey historically leads all other surf clam producing states in total landings.

**Figure 3: CURRENT CLASSIFICATIONS**



## **METHODS**

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 1992).

Two hundred and thirty nine water samples were collected for total and fecal coliform bacteria between 1993 and 1997 and analyzed by the three tube MPN method according to APHA (1970). Figure 4 shows the shellfish growing water quality monitoring stations in Area 46-47. Sixteen stations were monitored during each year.

Water quality sampling, shoreline and watershed surveys were conducted in accordance with the NSSP Manual of Operations, Part I, Appendix B (USPHS, 1992).

Data management and analysis was accomplished using database applications developed for the Bureau. Mapping of pollution data was performed with the Geographic Information System (GIS:ARCVIEW).

### **BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS**

The water quality of each growing area must be evaluated before an area can be classified as *Approved*, *Seasonally Approved*, *Special Restricted*, or *Seasonal Special Restricted*. Criteria for bacterial acceptability of shellfish growing waters are provided in Part I of National Shellfish Sanitation Program Manual of Operations - 1995 Revision. Each shellfish producing state is directed to adopt either the total coliform criterion, or the fecal coliform criterion. While New Jersey bases its growing water classifications on the total coliform criterion, it does make corresponding fecal coliform determinations for each sampling station, these data are viewed as adjunct information and are not directly used for classification. The State Shellfish Control Authority also has the option of choosing one of the two water monitoring sampling strategies for each growing area.

The Adverse Pollution Condition Strategy requires that a minimum of five samples (two samples if the area is designated a Remote area) be collected each year under conditions that have historically resulted in elevated coliforms in the particular growing area. The results must be evaluated by adding the individual station sample results to the preexisting bacteriological sampling results to constitute a data set of at least 15 samples for each station. The adverse pollution conditions usually are related to tide, and rainfall, but could be from a point source of pollution or variation could occur during a specific time of the year. Under this strategy, for *Approved* waters, the total coliform median or geometric mean MPN of the water shall not exceed 70 per 100 mL and not more than 10 percent of the samples exceed an MPN of 330 per 100 mL for the 3-tube decimal dilution test. For *Special Restricted* waters, the total coliform median or geometric mean MPN of the water shall not exceed 700 per 100 mL and not more than 10 percent of the samples exceed an MPN of 3300 per 100 mL for the 3-tube decimal dilution test. Areas to be *Approved* under the Seasonal classification must be sampled and meet the criterion during the time of the year that it is approved for the harvest of shellfish.

The Systematic Random Sampling strategy requires that a random sampling plan be in place before field sampling begins and can only be used in areas that are not affected by point sources of contamination. A minimum of six samples per station are to be collected each year and added to database to obtain a sample size of 30 for statistical analysis. The bacteriological quality of every sampling station in *Approved* areas shall have a total coliform median or geometric mean MPN not exceeding 70 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 330 per 100 mL. For *Special Restricted* areas, the bacteriological quality shall not exceed a total coliform median or geometric mean MPN of 700 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 3,300 per 100 mL.

Since this shellfish growing area contains a discharging WWTP outfall, the adverse pollution condition strategy was used to classify the waters.

### **MARINE BIOTOXINS**

The Department collects samples at regular intervals throughout the summer to determine the occurrence of marine biotoxins. This data is evaluated weekly by the Bureau of Marine Water Monitoring in accordance with the NSSP requirements. An annual report is compiled by the Bureau of Freshwater and Biological Monitoring.

### ***SHORELINE SURVEY***

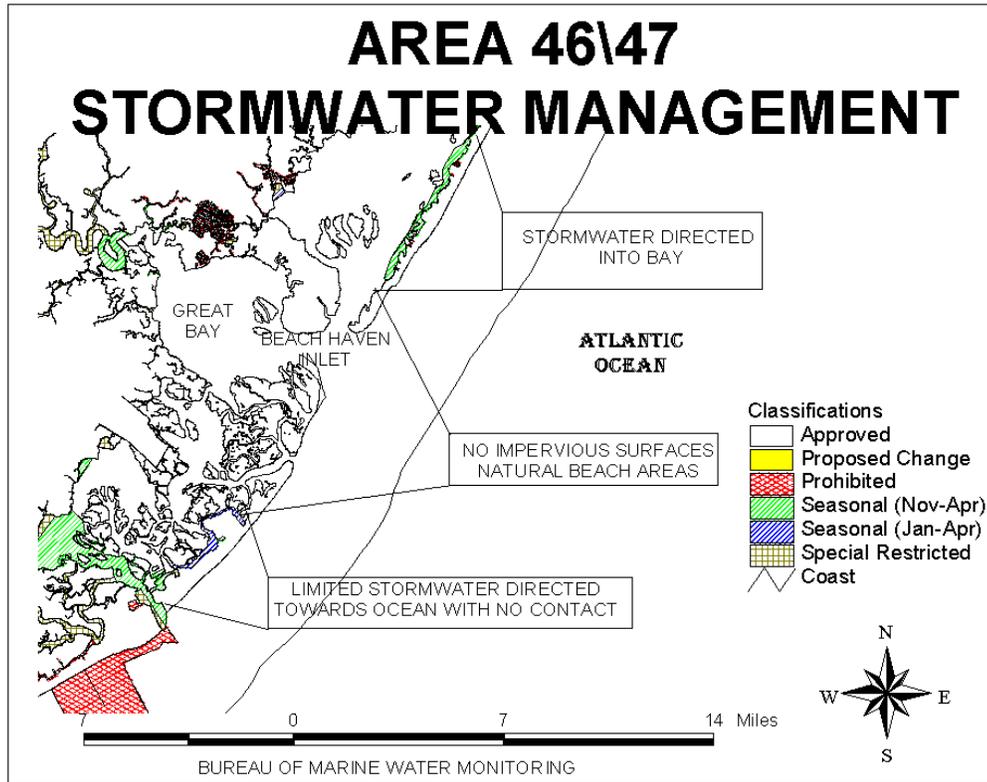
Although all bordering communities within the area under investigation have sanitary sewerage which in turn is connected to a regional system, none of the biologically treated effluent is discharged into these shellfish growing waters. Wastewater collected in Brigantine is processed at the Atlantic County Utilities Authority's WWTP for eventual ocean discharge off of Ventnor in Area 44, while the Ocean County Utilities Authority's southern WWTP treats the sanitary wastes from southern Long Beach Island for ultimate ocean disposal off of Ship Bottom in adjoining Area 48.

Mr. John T. Costello, Superintendent of Public Works for the city of Brigantine was visited on May 22, 1998, to review the management of the city's storm water runoff. It was estimated that less than 10% of Brigantine's runoff was directed towards the ocean. The drainage area is limited to a small section east (ocean side) of the last parallel street to the ocean (Ocean and Brigantine Avenues). Two outfalls discharge at the street ends of 14th and 15th Streets. These outfalls consists of openings through the road end bulkhead (scuppers) and discharge the street's runoff onto beach. The runoff is then percolated into the sand before reaching and impacting the ocean. The remaining streets either allow the stormwater to drain into the street end sand dune or into catch basins equipped with subsurface 24 inch perforated pipe and stone beds for final disposal. (17 streets are so equipped).

Because the sloping topography of Long Beach Island is away from the ocean, all storm water runoff is directed towards and discharged to the bay. Although surface runoff from

Long Beach Island will eventually enter the ocean via Beach Haven Inlet, its deleterious effect on water quality is, at this point, far reduced when compared to direct ocean discharge.

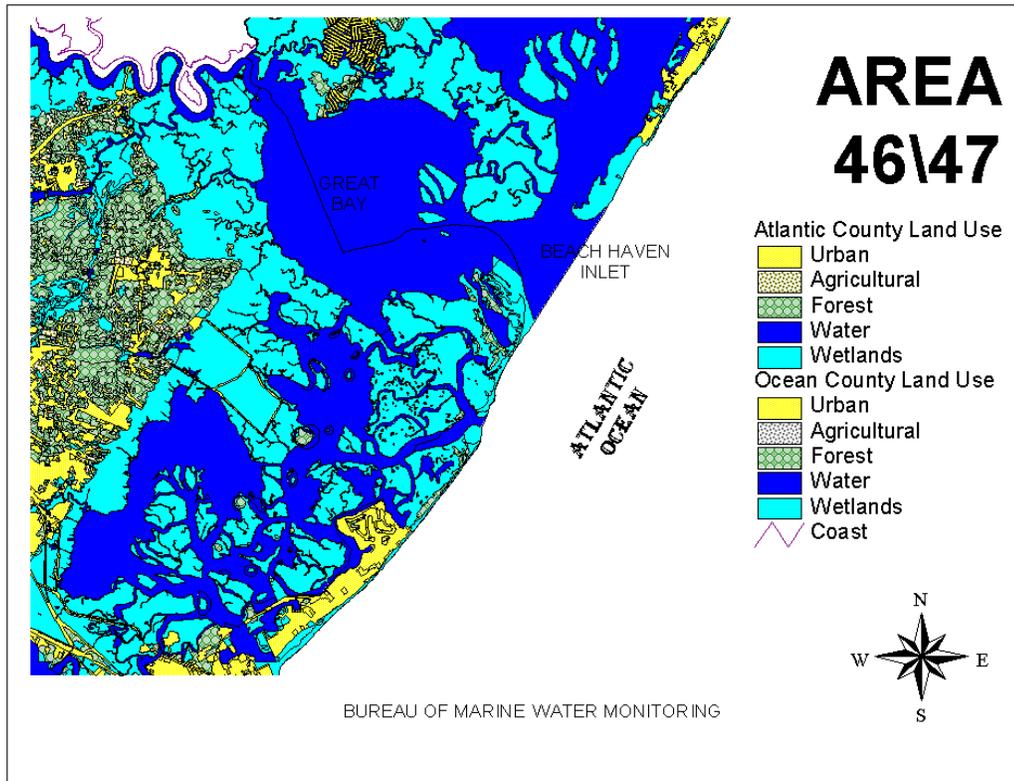
**Figure 4: STORMWATER DISCHARGES**



A major portion of the shoreline bordering Area 46 is comprised of the Brigantine Division of the Edwin B. Forsythe National Wildlife Refuge. This refuge contains a vast indigenous and migratory bird population that former investigations have shown not to be a significant nonpoint source of pollution to Area 46.

Currently, all of the water flowing into Area 46 from Beach Haven, Little Egg and Brigantine Inlets comes from estuarine areas that are classified as *Approved* shellfish growing waters. These bodies of water include the bays of Great, Little and Little Egg Harbor.

Figure 5: LAND USE MAP



### ***HYDROGRAPHY AND METEOROLOGY***

Precipitation inputs and environmental conditions to the area for the sampling period 1993 through 1997 are shown in the Table below. The primary weather station for this area is the National Oceanic and Atmospheric Weather Station located at Tuckerton. The secondary weather station for this area is the Senator Farley Marina, Atlantic City. The secondary station data is used when data from the primary station are incomplete. Since the Tuckerton station was not reporting during the majority of this investigation's time frame, the Senator Farley Marina station was utilized as the sole precipitation data source.

**Table 1: CLIMATOLOGICAL DATA**

**Rainfall Recorded at NOAA's Senator Farley Marina, Atlantic City  
at 2400 Hrs; Wind and Temperature aboard sampling  
vessel at time of sample collection**

Sampling Date	Precipitation in Inches					Wind		Temperature	
	MO/DAY/YR	SAME DAY	PRIOR 24 HRS.	PRIOR 48 HRS.	PRIOR 72 HRS.			AIR °C	WATER °C
6-7-93	0	0	.02	0					
9-9-93	.08	0	0	0					
12-9-93	0	0	0	0	3.38				
2-7-94	0	0	.02	0					
3-21-94	.57*	0	0	.01					
9-21-94	0	0	0	.76	.37				
9-26-94	0	0	0	.01	1.66				
7-7-95	0	0	0	0					
11-27-95	0	0	0	.14	.34				
5-14-96	0	0	.01	.68					
8-8-96	.61*	0	0	0					
8-27-96	0	0	0	.20					
8-30-96	0	0	0	0					
11-19-96	.14	.01	0	0					
6-13-97	.23*	0	0	0					

\* Fell after sampling.

Shaded boxes indicate rainfall data used in analysis

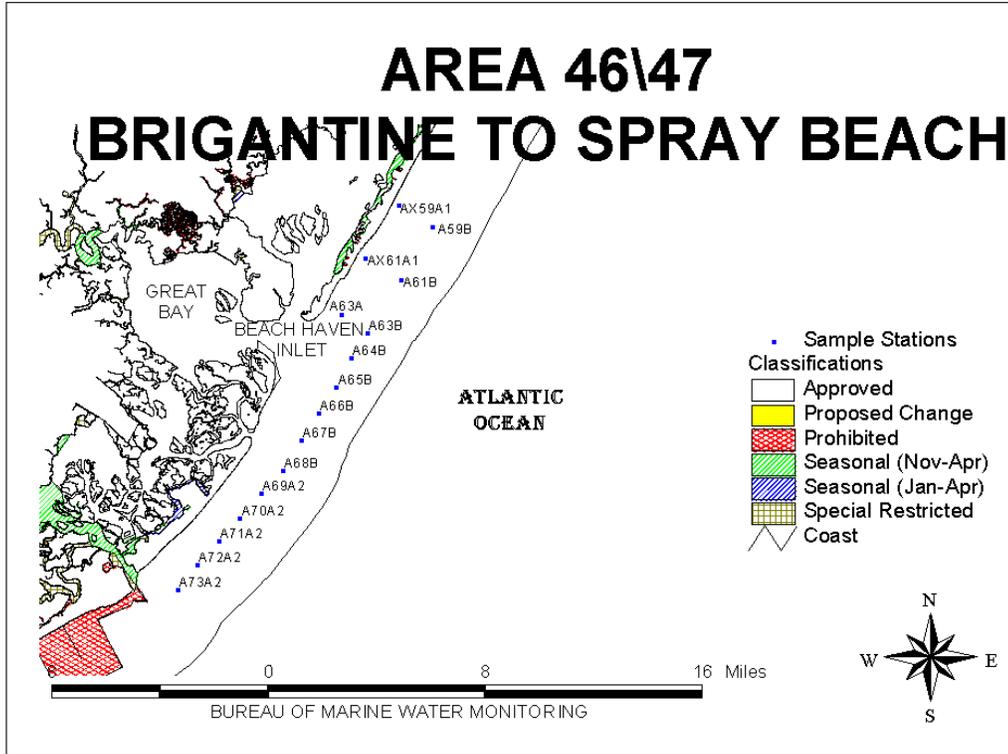
### ***WATER QUALITY STUDIES***

As noted above, the adverse pollution condition strategy was utilized to classify the waters contained within this area.

Water sampling for analysis was conducted on 15 different occasions starting in 1993 and ending in 1997.

The chart which follows shows the location of the 16 sampling stations used during the investigation.

Figure 6: CHART OF SAMPLING STATIONS



All stations were sampled on the surface making a grand total of 239 samples analyzed for total (T.C.) and fecal (F.C.) coliform.

The bacteriological results show acceptable (Approved) water quality by having all medians recording less than three and none exceeding nor even recorded in the percentile portion of the criteria. (A complete tabulated listing of the bacteriological data is contained in the Attachment).

## ***INTERPRETATION AND DISCUSSION OF DATA***

Five sample collections or 33% of the total number of runs, were conducted after a rainfall event as measured at the National Oceanic and Atmospheric weather station located in Atlantic City. The highest T.C. encountered after a rainfall event was only 3.6. To have the highest value at 3.6 after precipitation is an acknowledgment that rainfall runoff is not a problem to the area's water quality.

The highest T.C. level encountered during the entire investigation was 9.1. This non-rainfall related value was observed at Station AX61A1 on August 8, 1996, and does not indicate any adverse sanitary impact.

Further evidence supporting the historical "*excellent water quality*" description is that 224 of the total 239 T.C. values (94%) had recorded MPN counts of less than three which is the lowest detection limit of the analytical testing procedure used.

## ***CONCLUSIONS***

The following is concluded:

1. All of the waters contained within this 15 miles of ocean shoreline under survey meet the NSSP's criteria for *Approved* shellfish growing waters.
2. Rainfall runoff is not a detrimental factor to the regions water quality.
3. The non-point source of contamination associated with the avian population contained within the Edwin B. Forsythe National Wildlife Refuge does not impact the *Approved* waters of this region with elevated coliform levels.

## ***RECOMMENDATIONS***

It is recommended that:

1. The area's *Approved* shellfish growing water classification remain in effect.
2. This growing area's Remote area designation be continued. A Remote area is an area defined by the NSSP's Manual of Operations that is removed from human population, is not impacted by any actual or potential pollution sources and meets the *Approved* classification criteria. In return, this will reduce the minimum sampling frequency from five times per year to two times per year and allow valuable sampling resources to be utilized and concentrated in areas containing pollution sources such as stormwater and WWTP outfalls that should be monitored more frequently.

## ***LITERATURE CITED***

APHA. 1970. Recommended Procedures for the Examination of Seawater and Shellfish, 4th ed., American Public Health Association, Washington, DC

APHA. 1989. Standard Methods for the Examination of Water and Wastewater, 17th ed., American Public Health Association, Washington, DC

Connell, R.C. 1991. Evaluation of Adverse Pollution Conditions in New Jersey's Coastal Waters. New Jersey Department of Environmental Protection, Marine Water Classification and Analysis, Leeds Point, NJ.

NJDEP. 1992. Field Sampling Procedures Manual. New Jersey Department of Environmental Protection, Trenton, NJ.

NJDEP. 1993. State of New Jersey Shellfish Growing Water Classification Charts. New Jersey Department of Environmental Protection & Energy, Marine Water Classification and Analysis, Leeds Point, NJ.

NJDEP. 1998. State of New Jersey Shellfish Growing Water Classification Charts. New Jersey Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ.

USPHS. 1995. National Shellfish Sanitation Program Manual of Operations, Part I: Sanitation of Shellfish Growing Areas. US Public Health Service, Food and Drug Administration, Washington, DC

## ***ACKNOWLEDGMENTS***

This report was written under the direction of William J. Eisele, Jr., Chief, and James E. Mumman, Administrator. Robert Connell assisted in statistical and GIS data analysis. Thanks is given to Bonnie Zimmer for her continuing help in merging different computer software programs into producing one unified document. Special acknowledgment is given to Captain Joseph Rommell and Matt Schoen for collecting shellfish water quality samples in the ocean during this time frame. This study would not have been completed without the analytical capabilities of our microbiology laboratory staff, including Eric Feerst, Supervisor, Bob Seabrook, and Bruce Hovendon

Special recognition is also given to John Costello, Superintendent of Public Works, City of Brigantine, for providing information and material that assisted in making this shellfish growing waters classification possible.

***ATTACHMENT: BACTERIOLOGICAL DATA LISTING***

Attachments noted in this report are **not** available for download.